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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/929,350	08/15/2001	Jerome M. Eldridge	M4065.0454/P454	8862
24998	7590	09/10/2004	EXAMINER	
DICKSTEIN SHAPIRO MORIN & OSHINSKY LLP			CHU, CHRIS C	
2101 L STREET NW			ART UNIT	
WASHINGTON, DC 20037-1526			PAPER NUMBER	
			2815	
DATE MAILED: 09/10/2004				

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No. <u>09/929,350</u>	Applicant(s) ELDRIDGE ET AL.	
	Examiner Chris C. Chu	Art Unit 2815	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 10 May 2004.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1 - 183 is/are pending in the application.
- 4a) Of the above claim(s) 1 - 36, 45 - 59, 61, 73 - 87, 118, 129 and 132 - 183 is/are withdrawn from consideration.
- 5) ☒ Claim(s) 62 - 72, 103, 104, 125 and 126 is/are allowed.
- 6) ☒ Claim(s) See Continuation Sheet is/are rejected.
- 7) ☒ Claim(s) 44, 98, 111, 120 and 131 is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date <u>5/19/04</u> . | 6) <input type="checkbox"/> Other: _____ |

Continuation of Disposition of Claims: Claims rejected are 37 – 40, 43, 60, 88 – 91, 94, 95, 99 – 102, 107, 108, 112 – 115, 119, 121 – 124 and 130

DETAILED ACTION

Response to Amendment

1. Applicant's amendment filed on May 10, 2004 has been received and entered in the case.

Election/Restrictions

2. Claims 1 – 36, 45 – 59, 61, 73 – 87, 118, 129 and 132 – 183 continue to be withdrawn from consideration for the reasons provided in the Office action mailed on December 17, 2002.

Information Disclosure Statement

3. The information disclosure statement filed on May 19, 2004 fails to comply with the provisions of 37 CFR 1.97, 1.98 and MPEP § 609 because the reference "D" doesn't have a copy of the front page of the book. Thus, examiner is not sure that the reference "D" listed in the IDS and the reference material that is provided by the Applicant are same material or not. Therefore, examiner requesting a new 1449 form for the reference "D" and a copy of the front page of the book and copy of the chapter 8. Furthermore, would you please follow the general rule of the index (i.e., name of the author, title of the article, title of the book, pp, etc.)? Please! The information disclosure statement has been placed in the application file, but the information referred to therein has not been considered as to the merits. Applicant is advised that the date of any re-submission of

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any item of information contained in this information disclosure statement or the submission of any missing element(s) will be the date of submission for purposes of determining compliance with the requirements based on the time of filing the statement, including all certification requirements for statements under 37 CFR 1.97(e). See MPEP § 609 ¶ C(1).

Claim Rejections - 35 USC § 102

4. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

5. Claims 37 – 40, 43, 60, 88 – 91, 94, 95, 99 – 102, 107, 108, 112 – 115, 119, 121 – 124 and 130 are rejected under 35 U.S.C. 102(b) as being anticipated by Stupian et al. '364.

Regarding claim 37, Stupian et al. discloses in e.g., Fig. 1 and column 4, line 55 – column 5, line 10 a semiconductor package comprising:

- a hermetically sealed enclosure (10, 12 and column 4, line 67) surrounding said package (14);
 - a semiconductor chip (14) within said enclosure;
 - a first gas (any material in air which reads as first gas) within said enclosure;
- and

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- a thin layer (16a) deposited over at least part of or partially covering said semiconductor chip (at the side view point of Fig. 1; see figure in page 13 of this Office action) comprising a source of releasable hydrogen (column 5, lines 1 - 10) within said enclosure.

The hydrogen released from the bonding material is “capable of pressurizing the space within said enclosure to a pressure above the pressure associated with said first gas.” Whether the package is, in fact, pressurized is immaterial as this is intended use language, and it has been held that the recitation that an element is “capable of” performing a function is not a positive limitation but only requires the ability to so perform. In re Hutchison, 69 USPQ 138. Furthermore, Stupian discloses in Fig. 1, column 5, lines 1 – 10 and column 5, lines 28 – 35 that at some point, the released hydrogen inside of the Stupian’s enclosure produces a higher pressure than the outside of the enclosure. Thus, when the inside of the Stupian’s package has higher hydrogen gas partial pressure than the outside of the Stupian’s package, the releasable hydrogen of Stupian is capable of pressurizing the space within the enclosure to a pressure above the pressure associated with the first gas. Since Stupian’s structure is capable of performing the intended use and function, it meets the claims.

Regarding claims 38, 89, 100, 113 and 122, since Stupian et al. discloses in e.g., Fig. 1 air in space (between 10 and 12), said first gas comprises helium. Since Stupian et al. does not disclose that the package in Fig. 1 is formed with no air inside of the space between the bottom portion 10 and the lid portion 12, Stupian et al.’s package discloses air in a space that is formed between the elements 10 and 12. Inherently, air contains many different gases and helium is one of that many different gases. Thus, the air in the

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space between 10 and 12 of Stupian et al. includes helium. Therefore, Stupian et al. anticipates the claims.

Regarding claims 39, 90, 101, 114 and 123, since Stupian et al. discloses in e.g., Fig. 1 air in space (between 10 and 12), said first gas comprises hydrogen.

Regarding claims 40, 91, 102, 115 and 124, since Stupian et al. discloses in e.g., Fig. 1 air in space (between 10 and 12), said first gas comprises a mixture of helium and hydrogen. As explained in the above paragraph, Stupian et al. discloses in e.g., Fig. 1 air in space between the elements 10 and 12. Inherently, the air comprises many different gases that include helium and hydrogen. Thus, Stupian et al. anticipates the claims.

Regarding claim 43, Stupian et al. discloses in e.g., Fig. 1 and column 4, line 55 – column 5, line 10 said package further comprising at least one heat source (any one of circuit traces in the element 14) for heating the source of releasable hydrogen so as to effect the release of hydrogen. Inherently, when chip is operating, the chip produces heat. In other words, each one of circuit traces on the chip also produces a heat when the chip is operating. Since the source of releasable hydrogen (16a) of Stupian et al. is formed over the element 14 (see details in the claim 37 rejection), any one of circuit traces on the chip (element 14) of Stupian et al. read as at least one heat source that heats the source of releasable hydrogen. Furthermore, inherently, hydrogen is an unstable element that is easily effected by heat. Thus, when the any one of circuit traces on the chip (element 14) of Stupian et al. produces heat, the hydrogen in the source of releasable hydrogen is easily effected. Therefore, Stupian et al. anticipates the claims.

Regarding claim 60, Stupian et al. discloses in e.g., Fig. 1 further comprising a substrate (10), wherein said chip is attached to the substrate. Since Stupian et al. discloses

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in e.g., Fig. 1 the chip 14 being attached to the substrate at the desired location (i.e, a controlled area) by folded down chip connection (e.g., C4), Stupian et al. discloses the limitation “with a controlled collapse chip connection”.

Regarding claim 88, Stupian et al. discloses in e.g., Fig. 1 and column 4, line 55 – column 5, line 10 a semiconductor chip comprising:

- a hermetically sealed enclosure (10 and 12) surrounding said chip;
- an integrated circuit (14) within said enclosure;
- a gas (any material in air which reads as first gas) at a first pressure within said enclosure; and
- a thin layer (16a) deposited over (see the rejection in claim 37) at least part of or partially covering said semiconductor chip comprising a source of releasable hydrogen (column 5, lines 1 - 10) within said enclosure.

The hydrogen released from the bonding material is “capable of pressurizing the space within said enclosure to a pressure above the pressure associated with said first gas.” Whether the package is, in fact, pressurized is immaterial as this is intended use language, and it has been held that the recitation that an element is “capable of” performing a function is not a positive limitation but only requires the ability to so perform. In re Hutchison, 69 USPQ 138. Furthermore, Stupian discloses in Fig. 1, column 5, lines 1 – 10 and column 5, lines 28 – 35 that at some point, the released hydrogen inside of the Stupian’s enclosure produces a higher pressure than the outside of the enclosure. Thus, when the inside of the Stupian’s package has higher hydrogen gas partial pressure than the outside of the Stupian’s package, the releasable hydrogen of Stupian is capable of pressurizing the space within the enclosure to a pressure above the

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pressure associated with the first gas. Since Stupian's structure is capable of performing the intended use and function, it meets the claims.

Regarding claims 94, 107, 119 and 130, Stupian et al. discloses in e.g., Fig. 1 and column 4, line 55 – column 5, line 10 said chip further comprising at least one heat source (any one of circuit traces in the element 14; see the rejection in claims 43 and 70) for heating the source of releasable hydrogen so as to effect the release of hydrogen.

Regarding claims 95 and 108, Stupian et al. discloses in e.g., Fig. 1 and column 4, line 55 – column 5, line 10 said chip further comprising a plurality of heat sources (circuit traces in the element 14; see the rejection in claims 43 and 70) for heating the source of releasable hydrogen so as to effect the release of hydrogen.

Regarding claim 99, Stupian et al. discloses in e.g., Fig. 1 and column 4, line 55 – column 5, line 10 a semiconductor chip comprising:

- a hermetically sealed enclosure (10 and 12) surrounding said chip;
- an integrated circuit (14) within said enclosure;
- a heat-activated source of releasable hydrogen (16a; see the rejection in claim 62) within said enclosure; and
- a gas (any material in air which reads as first gas) at an elevated pressure within said enclosure,
- said gas comprising a first gas component and a second gas component, wherein said second gas component results from the release of said releasable hydrogen upon application of heat (see rejection in claim 43 and 70), and wherein said first gas component is initially present within said enclosure

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prior to the release of said releasable hydrogen, and said first gas component is initially present at a pressure lower than said elevated pressure.

Regarding claim 112, Stupian et al. discloses in e.g., Fig. 1 and column 4, line 55 – column 5, line 10 a semiconductor chip comprising:

- a hermetically sealed enclosure (10 and 12) surrounding said chip;
- a gas (any material in air which reads as first gas) at a first pressure within said enclosure; and
- a source of releasable hydrogen (16a) within said enclosure.

The hydrogen released from the bonding material is “capable of pressurizing the space within said enclosure to a pressure above the pressure associated with said first gas.” Whether the package is, in fact, pressurized is immaterial as this is intended use language, and it has been held that the recitation that an element is “capable of” performing a function is not a positive limitation but only requires the ability to so perform. In re Hutchison, 69 USPQ 138. Furthermore, Stupian discloses in Fig. 1, column 5, lines 1 – 10 and column 5, lines 28 – 35 that at some point, the released hydrogen inside of the Stupian’s enclosure produces a higher pressure than the outside of the enclosure. Thus, when the inside of the Stupian’s package has higher hydrogen gas partial pressure than the outside of the Stupian’s package, the releasable hydrogen of Stupian is capable of pressurizing the space within the enclosure to a pressure above the pressure associated with the first gas. Since Stupian’s structure is capable of performing the intended use and function, it meets the claims.

Regarding claim 121, Stupian et al. discloses in e.g., Fig. 1 and column 4, line 55 – column 5, line 10 a semiconductor chip comprising:

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- a hermetically sealed enclosure (10 and 12) surrounding said chip;
- a heat-activated source of releasable hydrogen (16a) within said enclosure;
- and
- a gas (any material in air which reads as first gas) at an elevated pressure within said enclosure,
- said gas comprising a first gas component and a second gas component, wherein said second gas component results from the release of said releasable hydrogen upon application of heat, and wherein said first gas component is initially present within said enclosure prior to the release of said releasable hydrogen, and said first gas component is initially present at a pressure lower than said elevated pressure.

Claim Rejections - 35 USC § 103

6. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

7. Claims 41, 42, 92, 93, 96, 97, 105, 106, 109, 110, 116, 117, 127 and 128, are rejected under 35 U.S.C. 103(a) as being unpatentable over Stupian et al. in view of Babcock et al. '634.

Stupian et al. discloses the claimed invention except for said source of releasable hydrogen being titanium hydride. However, Babcock et al. teaches in column 1, lines 11 – 22 a source of releasable hydrogen being titanium hydride. Thus, it would have been

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obvious to one of ordinary skill in the art at the time when the invention was made to modify Stupian et al. by substituting the titanium hydride at the place of source of releasable hydrogen material of Stupian et al. as taught by Babcock et al. The ordinary artisan would have been motivated to modify Stupian et al. in the manner described above for at least the purpose of increasing bond strength between the chip and board by satisfactorily wet both members (column 1, line 13).

Allowable Subject Matter

8. Claims 66, 67, 103, 104, 125 and 126 are allowed (see previous Office action for details).

9. Claims 62 – 65 and 68 – 72 are allowed.

(a) The following is an examiner's statement of reasons for allowance:

The prior art of record does not teach or reasonably suggest, either singularly or in combination, at least a heat-activated source of releasable hydrogen within said enclosure.

Any comments considered necessary by applicant must be submitted no later than the payment of the issue fee and, to avoid processing delays, should preferably accompany the issue fee. Such submission should be clearly labeled "Comments on Statement of Reasons for Allowance."

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10. Claims 44, 98, 111, 120 and 131 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

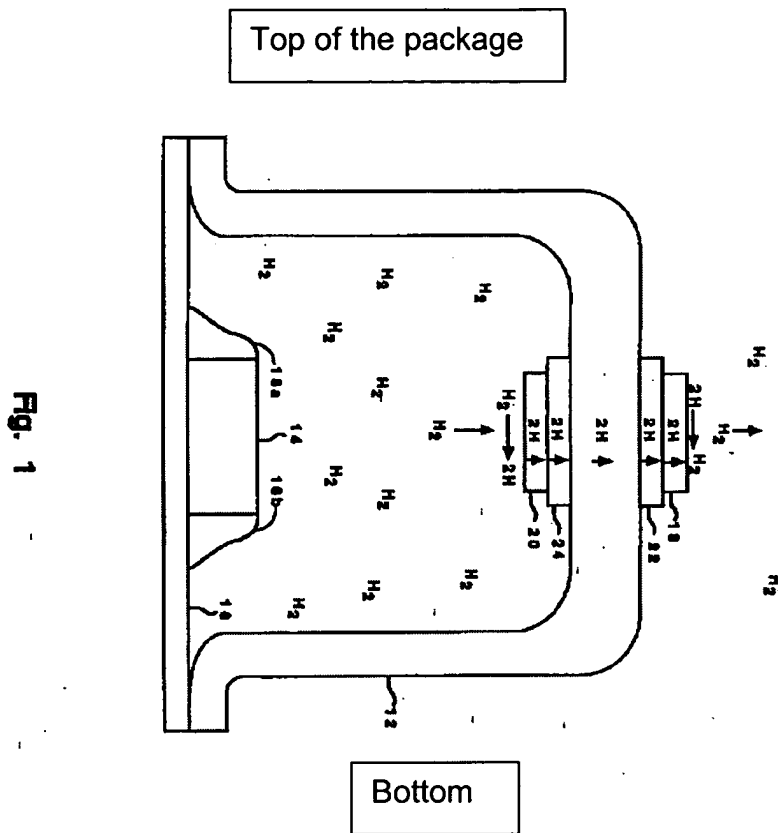
(a) Claim 44 contains allowable subject matter because none of references of record teach or suggest, either singularly or in combination, at least the limitation of a plurality of heat sources for heating the source of releasable hydrogen so as to effect the release of hydrogen.

(b) Claims 98, 111, 120 and 131 contain allowable subject matter because none of references of record teach or suggest, either singularly or in combination, at least the limitation of a heater and associated heater circuitry.

Response to Arguments

11. Applicant's arguments filed on May 10, 2004 have been fully considered but they are not persuasive.

On page 38, applicant argues "Stupian does not teach the limitations of claim 37 or claim 88. Claims 37 and 88 recite 'a thin layer deposited over at least part of said semiconductor chip comprising a source of releasable hydrogen within said enclosure.' ... claims 37 and 88 is 'deposited over at least part of said semiconductor chip,' not on the wall of the package." This argument is not persuasive. Stupian clearly shows in Fig. 1 that the thin layer (16a) deposited over at least part of said semiconductor chip (14).



Further, applicant argues “the placement of the window of Stupian versus the placement of the source of releasable hydrogen of claim 37 and 88 belies the opposing purposes and functionalities of Stupian versus the present Application.” Since applicant merely argues purpose and functional differences rather than pointing out specific structural differences, the argument is not persuasive. Furthermore, since Stupian discloses in Fig. 1 and column 5, lines 1 – 10 the thin layer (16a) ... comprising a source of releasable hydrogen (column 5, lines 1 - 10) within said enclosure (10 and 12). Finally, Stupian discloses in Fig. 1, column 5, lines 1 – 10 and column 5, lines 28 – 35 that at some point, the released hydrogen inside of the Stupian’s enclosure produces a higher pressure than the outside of the enclosure. Thus, when the inside of the Stupian’s package

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has higher hydrogen gas partial pressure than the outside of the Stupian's package, the releasable hydrogen of Stupian is capable of pressurizing the space within the enclosure to a pressure above the pressure associated with the first gas. Since Stupian's structure is capable of performing the intended use and function, it meets the claims.

Next, applicant argues "reference number 16a of Stupian is not 'a heat-activated source of releasable hydrogen,' as recited in claims 62, 99 and 121." This argument is not persuasive. Inherently, hydrogen in any material releases more from the material when the material received heat. Since the reference number 16a of Stupian is attached to the chip (14) which produces heat during the operation, the reference number 16a of Stupian read as a heat-activated source of releasable hydrogen.

Next, applicant argues "Stupian does not teach 'wherein said second gas component results from the release of said releasable hydrogen upon applicant of heat,' as recited in claim 62." This argument is not persuasive. Stupian discloses in Fig. 1 and column 5, lines 1 – 10 said second gas component (hydrogen) results from the release of said releasable hydrogen (16a) upon applicant of heat (heat from the chip).

Finally, applicant argues "Claim 112 recites, *inter alia*, 'said source of releasable hydrogen capable of releasing hydrogen for pressurizing the space within said enclosure to a pressure above the first pressure.' As discussed above, Stupian relates to out-venting hydrogen through a window. Stupian does not teach the limitations of claim 112." This argument is not persuasive. As explained in the above paragraphs, at some point, inside

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of the Stupian's enclosure has a higher pressure by the released hydrogen than the outside of the enclosure and the first pressure (see Fig. 1 and column 5, lines 1 - 10). Thus, Stupian anticipates the rejected claim.

For the above reasons, the rejection is maintained.

Conclusion

12. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Chris C. Chu whose telephone number is (703) 305-6194. The examiner can normally be reached on M-F (10:30 - 7:00).

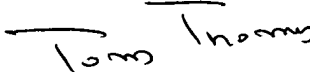
If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Tom Thomas can be reached on (703) 308-2772. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

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Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Chris C. Chu
Examiner
Art Unit 2815

c.c.
8/23/04 5:09:27 AM


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SUPERVISORY PATENT EXAMINER
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